TRAFFIC

INTRODUCTION

The purpose of this technical section of the Report is to document the existing traffic information at the proposed Crestview Estates Subdivision located on Chestnut Street in North Reading, Massachusetts in accordance with the Town of North Reading Rules and Regulations. The project consists of the subdivision of a parcel of land abutting Chestnut Street in the south and Flint Street in the west that when fully constructed will include 13 new buildable lots. Frontages for the new lots and all the driveways will be on Crestview Drive, a new fully built roadway with its southern terminus at Chestnut Street and its western terminus at Flint Street.

The standards used for analysis conform to the most recent editions of the ***Manual on Uniform Traffic Control Devices (MUTCD)***, the ***Highway Capacity Manual (HCM)***, and are consistent with the guidelines set forth by the ***Massachusetts Department of Transportation (MassDOT)***.

Figure T1 is the Locus Map showing the proximity of the Crestview Estates Development and the surrounding roadway network.

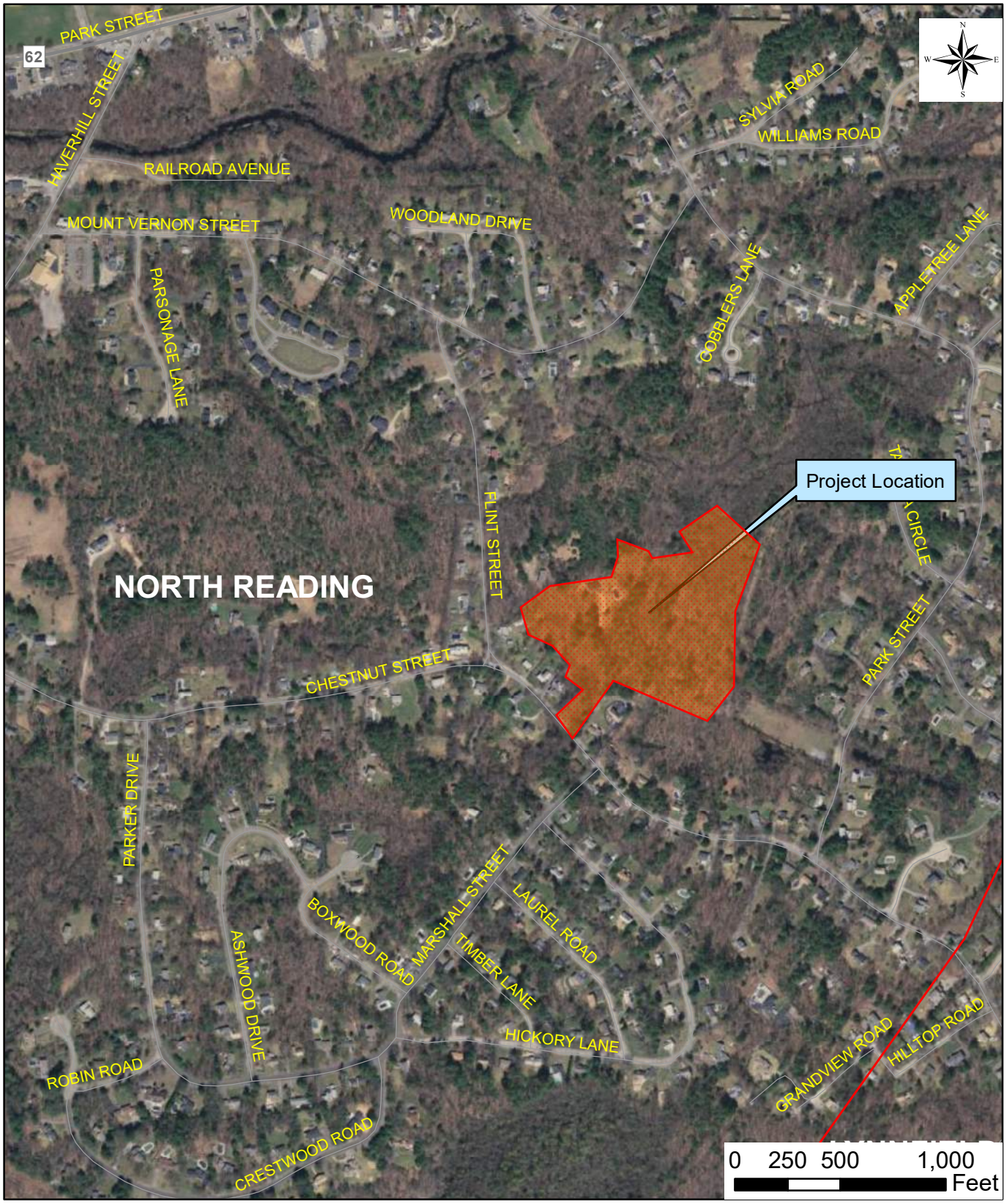


Figure T1: Locus Map

Crestview Estates
North Reaing. MA

Data Source: MassGIS

ASB design group
363 Boston Street
Topsfield, MA 01983

EXISTING CONDITIONS

The project's primary impact area is proposed to be identified by the immediate roadway segments of Chestnut Street and Flint Street. The following section documents the existing traffic conditions in the vicinity of the project.

Chestnut Street

Chestnut Street is classified by the Massachusetts Department of Transportation (MassDOT) as an urban collector or rural minor collector and classified as a Rural Minor Arterial under the Federal Functional Classification system. Chestnut Street runs in the east-west directions with its western terminus at Park Street and its eastern terminus at Lynnfield Town Line. The posted speed limit along the roadway is 30 miles per hour. The land use along Chestnut Street is primarily residential. The roadway is within the jurisdiction of the Town of North Reading. Chestnut Street is approximately 22 feet wide, with one lane in each direction. A double yellow centerline separates the travel lanes at the site. No sidewalks are present on either side of Chestnut Street. Utility poles are located on the northerly side of the road along the westbound side.

Looking eastbound on Chestnut Street

Looking westbound on Chestnut Street

Flint Street

Flint Street is classified by the Massachusetts Department of Transportation (MassDOT) as a local roadway, which runs in the north-south directions with its northern terminus at Mount Vernon Street and its southern terminus at Chestnut Street. The roadway is not posted for a speed limit. On roadways without any posted speed limit sign, speed limit is the Prima Facie sped. In North Reading, the Prima facie speed limit is 25 miles per hour. The land use along Flint Street is primarily residential. The roadway is within the jurisdiction of the Town of North Reading. Flint Street is approximately 20 feet wide, with one lane in each direction. A single yellow centerline separates the travel lanes at the site. No sidewalks are present on either side of Flint Street. Utility poles are located on the easterly side of the road along the northbound side.

Looking northbound on Flint Street

Looking southbound on Flint Street

Existing Traffic Volumes

Automated Traffic Recorders

A traffic counting program is conducted each year by the Statewide Traffic Data Collection section of the Massachusetts Department (MassDOT) of transportation. The program involves the systematic collection of traffic data utilizing automatic traffic recorders located on various roadways throughout the state.

The principal traffic volume parameters from MassDOT data for Chestnut Street and Flint Street in North Reading are given below for this section of the roadway.

Table T1 MassDOT Statewide Traffic Data from Count Station # 216403

Location	ADT	D	A.M. Peak	P.M. Peak
Chestnut Street	4,283	53% EB	415	440
Flint Street	1,154	52% SB	104	126

Safety Analysis

Crash Data

ASB reviewed the crash data available from MassDOT for the five (5) most recent Complete Data (Closed) years available – 2014 to 2018 – for the study intersections. There were no crashes reported for either Chestnut Street or Flint Street segments.

PROPOSED CONDITIONS

The proposed Crestview Drive will run in the southeast-northwest directions with its south-eastern terminus at Chestnut Street and its north-western terminus at Flint Street.

The intersection of Crestview Drive at Chestnut Street

The intersection of Crestview Drive at Chestnut Street is located approximately 480' east of the unsignalized intersection of Flint Street at Chestnut Street. The proposed intersection is a 3-legged un-signalized intersection with Crestview Drive approaching from the north, and Chestnut Street approaching from the east and the west. The posted speed limit at the intersection of Crestview Drive and Chestnut Street is 30 mph in both directions. Crestview Drive is a two-way roadway with one lane in each direction with double yellow line separating the travel lanes. Crestview Drive is 28 feet wide and the minor movement at the intersection. Approaching the intersection Chestnut Street operates freely, while Crestview Drive will be controlled by a stop sign.

The intersection of Crestview Drive at Flint Street

The intersection of Crestview Drive at Flint Street is located approximately 500' north of the unsignalized intersection of Flint Street at Chestnut Street. The proposed intersection is a 3-legged un-signalized intersection with Crestview Drive approaching from the east, and Flint Street approaching from the north and the south.

Crestview Drive is a two-way roadway with one lane in each direction with double yellow line separating the travel lanes. Crestview Drive is 28 feet wide and the minor movement at the intersection. Approaching the intersection Flint Street operates freely, while Crestview Drive will be controlled by a stop sign.

Future Vehicular Traffic

ASB used the Institute of Transportation Engineers (ITE) publication Trip Generation, 10th Edition to estimate the vehicle trip rates for the proposed development and establish the net trips as a result of the proposed subdivision.

Trip generation rates for the subdivisions were based on Land Use Code (LUC) 210 (Single-family Detached Housing). Table T2 summarize the total Project generated trips for the daily morning and evening peak hours.

Table T2 Site Generated Trips

	Proposed Trips
Weekday Daily	159
Entering	79
Exiting	80
Weekday Morning Peak	13
Entering	3
Exiting	10
Weekday Evening Peak	16
Entering	10
Exiting	6

The trips to/from the proposed development will be distributed and assigned based on the existing travel patterns and logical travel routes through the existing roadway network within the Town of North Reading. The Trip Distribution percentages and assignments specific to the development at intersections of Crestview Drive at Chestnut Street and Flint Street are shown in Table T3.

Table T2 Site Generated Trips

	Crestview Dr at Chestnut St 65%	Crestview Dr at Flint St 35%
Weekday Morning Peak	9	4
Entering	2	1
Exiting	7	3
Weekday Evening Peak	11	5
Entering	7	3
Exiting	4	2

Based on the MassDOT Statewide Traffic Data, and above site generated trips, we believe that the proposed development will not significantly impact the area traffic, and both Chestnut Street and Flint Street will continue to operate at their current levels of service with no additional delays on all approaches.

Site Distance

Sight distance is the length of roadway ahead that is visible to the roadway user. In most cases, specific sight distance measures apply to motor vehicles and bicyclists. At intersections sight distance is provided to allow drivers to perceive the presence of potentially conflicting vehicles. This should occur in sufficient time for a motorist to stop or adjust their speed, as appropriate, to avoid colliding in the intersection. Sight distance also allows drivers of stopped vehicles with a sufficient view of the intersecting roadway to decide when to enter or cross the intersecting roadway. AASHTO's *A Policy on the Geometric Design of Highways and Streets* provides procedures to determine desirable sight distances at intersections for various cases are described below and include:

- Case A – Intersections with no control on any approach
- Case B – Intersections with stop control on the minor street
- Case C – Intersections with yield control on the minor street
- Case D – Intersections with traffic signal control
- Case E – Intersections with all-way stop sign control
- Case F – Left turns from the major road

Crestview Drive is the minor movement at the 3-legged intersection and is controlled by a stop sign, which is in conformance with Case B. The excerpt below from Section 3.7.4.4 of MassDOT Project Development & Design Guide 2006 Edition describes the method used to determine the desirable Site Distance.

Case B – Stop Control on Minor Street

At an intersection with stop control on the minor street, as illustrated in Table T4, the stopped minor-street driver must be able to see motor vehicles and bicycles approaching on the major street from either direction, at sufficient distance to allow crossing or turning maneuvers from the minor street. The leg of the intersection sight triangle on the minor street (Dimension A) is the distance between the driver's eye and front of vehicle (8 feet) plus distance from front of vehicle to edge of pavement (6.5 feet, prefer 10 feet) plus the distance from edge of pavement to middle of lane of interest (e.g., 6 feet for a right turn, 18 feet for a left turn on an undivided 2-lane highway, etc.) The major street leg of the triangle is the intersection sight distance along the major road (Dimension B).

Left Turns from Stop Controlled Minor Street

For motor vehicles making a left turn, the intersection sight distance along the major street (Dimension B) is given for an intersection with two 2-lane streets in Table T4. It is recommended that this intersection sight distance (Dimension B) be applied along the major street for left turns.

Crestview Drive at Chestnut Street

At a design speed of 30 mile per hour for Chestnut Street, the recommended intersection sight distance (Dimension B) is 335 feet. The present layout has a minimum of 450' (Figure #3 – Line of Sight Areal Image is included in the Appendix).

Crestview Drive at Flint Street

At a design speed of 25 mile per hour for Flint Street, the recommended intersection sight distance (Dimension B) is 280 feet. The present layout has a minimum of 350' (Figure #3 – Line of Sight Areal Image is included in the Appendix).

Right Turns from Stop Controlled Minor Street

For motor vehicles making a right turn from the minor street, the intersection sight distances are given in Table T4. It is recommended that this intersection sight distance (Dimension B) be applied along the major street for right turns.

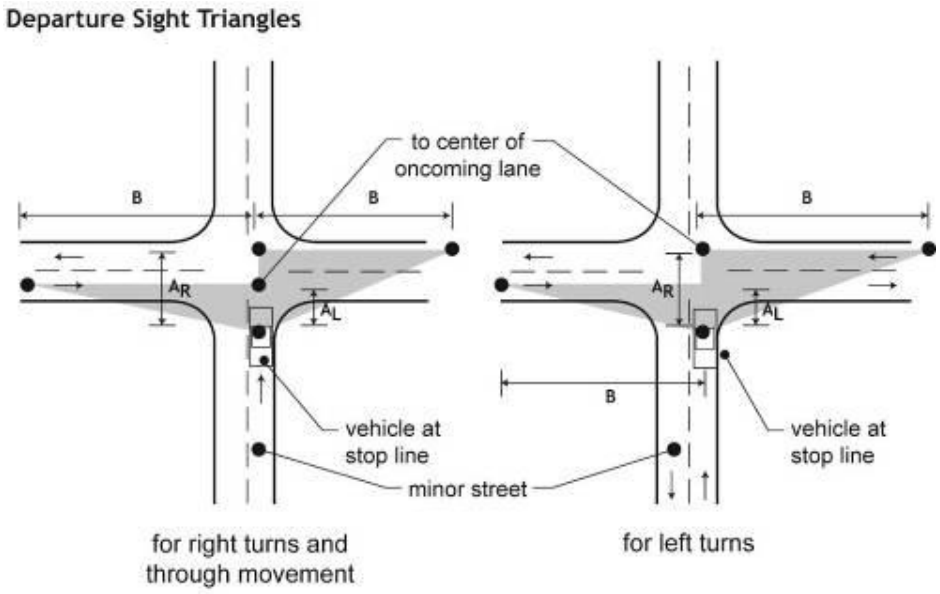
Crestview Drive at Chestnut Street

At a design speed of 30 mile per hour for Chestnut Street, the recommended intersection sight distance (Dimension B) is 290 feet. The present layout has a minimum of 360' (Figure #3 – Line of Sight Areal Image is included in the Appendix).

Crestview Drive at Flint Street

At a design speed of 25 mile per hour for Flint Street, the recommended intersection sight distance (Dimension B) is 240 feet. The present layout has a minimum of 350' (Figure #3 – Line of Sight Areal Image is included in the Appendix).

Table T4 Sight Distance Criteria - Sight Triangle Case B



Sight Triangle Legs: Case B – Stop Control on Cross Street

Major Street Design Speed (mph)	Length of Sight Triangle Legs (feet)			
	Minor Street for Vehicles Approaching From Right (A_R, feet)	Minor Street for Vehicles Approaching From Left (A_L, feet)	Major Street For Left Turns (B, feet)	Major Street for Right Turns or Through (B, feet)
15	32.5	20.5	170	145
20	32.5	20.5	225	195
25	32.5	20.5	280	240
30	32.5	20.5	335	290
35	32.5	20.5	390	335
40	32.5	20.5	445	385
45	32.5	20.5	500	430
50	32.5	20.5	555	480
55	32.5	20.5	610	530
60	32.5	20.5	665	575
65	32.5	20.5	720	625
70	32.5	20.5	775	670
75	32.5	20.5	830	720

Sight triangle legs shown are for passenger car crossing or turning into a two-lane street, with grades (all approaches) 3 percent or less. For other grades and for other major street widths, recalculate using AASHTO *Green Book* formulas.

Source: *A Policy on Geometric Design of Streets and Highways*, AASHTO, Washington DC, 2004. Chapter 3 Elements of Design

Stopping Sight Distance (SSD) is the length of the roadway ahead that is visible to the driver and should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. Stopping sight distance is the sum of the distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied and the distance needed to stop the vehicle from the instant brake application begins.

The SSD values associated with a given design speed are shown in Table T55. The site distance evaluations for the intersection are shown in Table T6.

Table T5 Sight Distance Criteria

DESIGN SPEED	DESIGN STOPPING SIGHT DISTANCE VALUE[1] (SSD)	RECOMMENDED INTERSECTION SIGHT DISTANCE VALUE[2] (ISD)
(MPH)	(FT)	(FT)
15	80	170
20	115	225
25	155	280
30	200	335
35	250	390
40	305	445
45	360	500
50	425	555
55	495	610
60	570	665
65	645	720
70	730	775
75	820	830
80	910	885

Source: *A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)*

[1]Design value based on a grade of less than 3%, a brake reaction distance predicted on a time of 2.5 seconds and a deceleration rate of 11.2 ft/s^2

[2]Recommended value based on Case B1 - a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less

We used the posted 30 MPH speed limit for Chestnut Street, and the Prima Facie speed limit of 25 MPH for Flint Street to calculate the minimum sight distances.

Table T6 Proposed Sight Distance Evaluation

INTERSECTION	POSTED SPEED (MPH)	MINIMUM (FEET)[1,2]	MEASURED (FEET)	OBSTRUCTION
Chestnut Street at the new Street				
Stopping Sight Distance:				
Chestnut Street Eastbound	30	200	360	
Chestnut Street Westbound	30	200	450	
Intersection Sight Distance:				
Looking to the right from Crestview Dr.	30	335	450	Horizontal Curve
Looking to the left from Crestview Dr.	30	335	360	
Flint Street at the new Street				
Stopping Sight Distance:				
Flint Street Eastbound	25	155	350	
Flint Street Westbound	25	155	350	
Intersection Sight Distance:				
Looking to the right from Crestview Dr.	25	280	350	
Looking to the left from Crestview Dr.	25	280	350	

Source: A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)
[1] Table 3-1. Stopping Sight Distance on Level Roadways
[2] Table 9-6. Design Intersection Sight Distance - Case B1, Left Turn from Stop

At both intersections of Chestnut Street at Crestview Drive, and Flint Street at Crestview Drive the values for SSD and ISD exceed the minimum values. However, ASB recommends installing "Combination Horizontal Alignment/Intersection" Sign (W1-10dR and W1-10dL) at Chestnut Street for each approach.

Fire Truck Turning Movements

Figure shows the turning movements for the largest fire truck for the North Reading Fire Department. The fire truck can make both turns into and exiting the site from both entrances.